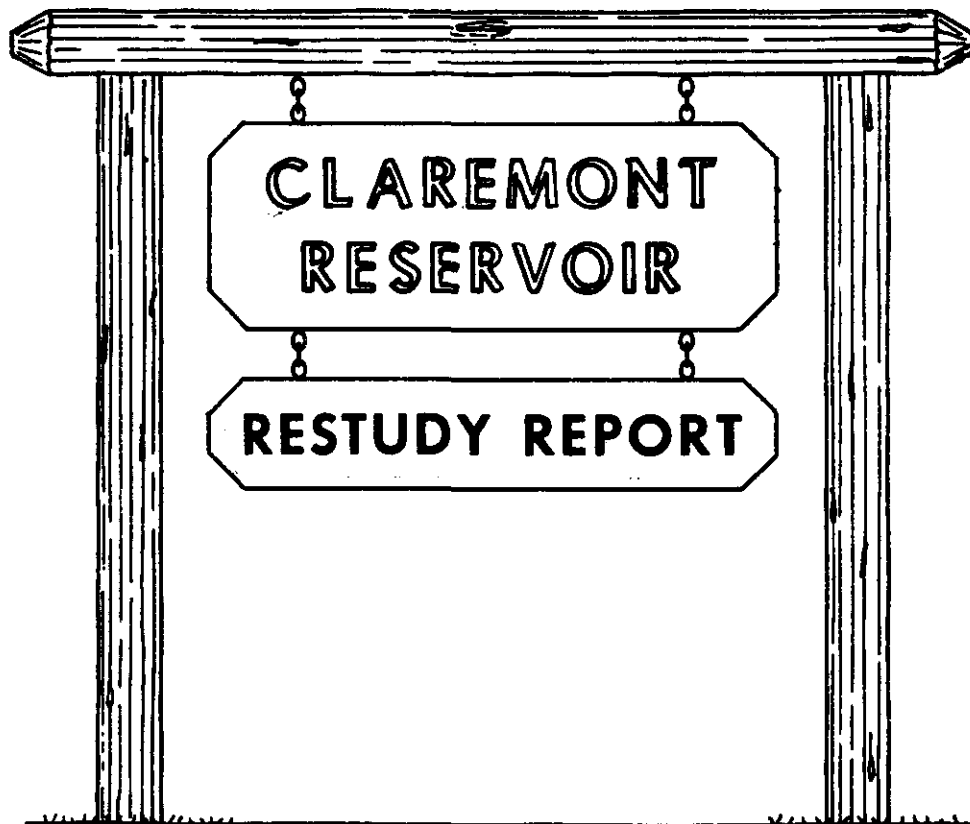


WATER RESOURCES DEVELOPMENT



**U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS WALTHAM, MASS.**

JANUARY 1965

CLAREMONT DAM AND RESERVOIR, NEW HAMPSHIRE

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CLAREMONT DAM AND RESERVOIR, NEW HAMPSHIRE

RESTUDY AUTHORIZATION

1. The Claremont Dam and Reservoir project is located on the Sugar River, a tributary of the Connecticut River. The project is an essential part of the authorized plan for flood control in the Connecticut River Basin. The project has not been constructed, nor has the Governor of the State of New Hampshire concurred in its construction. A restudy was authorized to determine the present views of the State of New Hampshire, and to ascertain the present need for the project. Funds were provided in the Fiscal Year 1963 Public Works Appropriation Act to accomplish the restudy.

2. Purpose. The purpose of this study is to determine the present economic justification of the project including all beneficial uses that might be included and to determine the attitude of the Governor of the State of New Hampshire and the Connecticut River Flood Control Compact Commission regarding project construction.

3. Scope. In accordance with EM 1120-2-101, the scope of the restudy has been held to the minimum required to establish the current need, engineering feasibility, economic justification, and local support for the project. Costs, benefits, and engineering details have been developed to the degree necessary to support conclusions but are not intended to be so complete as to eliminate the need for further preconstruction planning studies of the detailed design memoranda type.

4. Project Authorization. The project was authorized by the following Acts:

a. 1938 Flood Control Act (Public Law 761, 75th Congress) approved the comprehensive plan for flood control and other purposes as set forth in H. D. 455, 75th Congress. H. D. 455 included Claremont Reservoir as a single-purpose flood control project containing 60,000 acre-feet of flood storage.

b. 1941 Flood Control Act (Public Law 228, 77th Congress). Public Law 228 authorized the construction of reservoirs of the comprehensive plan approved by the 1938 Act, and modified the plan to include the works recommended by the Chief of Engineers in H. D. 653 and H. D. 724 with such further modifications as may be found desirable in the discretion of the Secretary of War and the Chief of Engineers.

H. D. 724 lists the Claremont Reservoir project with 78,400 acre-feet of storage for flood control purposes. The report of the Board of Engineers for Rivers and Harbors noted that, "where it is contemplated that additional storage will be provided for streamflow regulation, provision will be made either for raising the dam in the future, or where the storage is now justified, for providing the additional storage initially."

c. 1944 Flood Control Act (Public Law 534, 78th Congress). This Act recognized the interests and rights of the States in determining the development of the watersheds within their borders and provided that the affected State would be given information developed by the investigations, and opportunity for consultation regarding plans and proposals.

Section 4 of the 1944 Act authorized the Chief of Engineers to construct, maintain and operate public park and recreational facilities in reservoirs under control of the War Department.

5. Reports of Other Agencies.

a. Connecticut River Flood Control Compact. - The Connecticut River Flood Control Compact between the States of Connecticut, Massachusetts, Vermont and New Hampshire was approved by the Congress on 6 June 1953 under Public Law 52, 83rd Congress. The principal purposes of the Compact are to promote interstate comity between the signatory states, to assure adequate storage capacity for impounding water for the protection of life and property from floods and to provide a common agency through which the signatory states may effectively cooperate in accomplishing the objects of flood control and water resource utilization.

The Compact provides for reimbursement between the States for taxes lost to their political subdivisions by reason of ownership by the United States of lands, rights or other property therein for the various flood control projects approved by the Compact Commission. Under the Compact, the Commission is also empowered to determine the amounts of, and the States agree to share in payment for, economic losses and damages occurring by reason of ownership of property by the United States for construction and operation of any flood control dam and reservoir constructed after 6 June 1953 by the United States in the Connecticut River Valley. Speculative losses and damages are excluded from reimbursement.

The Claremont Dam and Reservoir project is not specifically mentioned in the Compact. The Commission is empowered to decide for any flood control project to be situated in the Connecticut River Valley whether, in its opinion, the flood control benefits to be derived in the signatory states justify the assumption by the signatory states of the obligation to make reimbursement for loss of taxes and for economic losses and damages.

b. NENYIAC Report. A report prepared by the New England-New York Inter-Agency Committee (NENYIAC) entitled "The Resources of the New England-New York Region" was submitted to the President of the United States by the Secretary of the Army on 27 April 1956 and printed in part as Senate Document No. 14. The NENYIAC report includes a flood control plan for the Connecticut River Basin. The Claremont Dam and Reservoir project is included as one unit in the plan.

6. Present Project Classification

The project authorization is based on studies made in the late 1930's and early 1940's for a flood control project with the inclusion of recreation facilities as desired by local interests. Construction has been deferred pending concurrence of the State of New Hampshire. The project is currently classified as "deferred for restudy" to permit re-examination of project scope to meet current needs of the area, its economic justification and to determine the present views of the State of New Hampshire.

7. Location

The site of the Claremont Dam and Reservoir is on the Sugar River about 7.1 miles upstream from its confluence with the Connecticut River, and about one mile southeast from Claremont, New Hampshire. The site controls a drainage area of 245 square miles.

8. Economic Development.

There are located in the project area one industrial establishment, 12 commercial concerns, 27 sets of farm buildings, and 51 residential dwellings. The reservoir area is situated about one mile from the industrial city of Claremont which is recovering from the loss of textile manufacturing, and diversifying its industrial base. A steady expansion in population, income, and manufacturing activity is anticipated over project life in the area affected by operation of the project.

9. Problems Under Investigation

All potential water resource project uses have been considered and those appearing to provide substantial benefit have been investigated to determine if incorporation in the project is warranted. Purposes which have been considered in depth are discussed in the following paragraphs.

10. Flood Control

The project considered in the latest authorizing legislation provides 78,400 acre-feet of flood control storage, equivalent to six inches of runoff from the drainage area of 245 square miles. Studies were made of varying volumes of storage to ascertain the most beneficial operation. These studies indicate that the full authorized volume should be available in the winter and spring months, and that a smaller volume is required during the summer and early fall seasons. Utilizing part of the storage, about 10,000 acre-feet for serving multiple-purpose use for flood control and recreation will increase project utility and project benefits.

Flood control benefits have been computed for the Claremont project as next added in a 16-reservoir system of which 13 are existing, one is under construction, and two are in design status in the Connecticut River Basin. This is a more stringent benefit concept than employed in the authorizing documents which distributed benefits in proportion to their drainage areas. At current (1964) price levels, after adjustments to reflect economic growth expected to take place over the project life, the annual flood reduction benefits amount to \$618,000.

11. Recreation

a. In 1960, 336,600 people resided within a 50-mile radius (one hour's driving time) of the project. Demographic projections made by the U. S. Department of Commerce show the population is expected to increase to 529,000 by the year 2000. Projecting this increase to the year 2070, the end of the project's life, gives a population of 1,379,000 residing within easy driving distance of the project. It is estimated on the basis of these projections that adequate recreational features, including water-oriented facilities, would attract 250,000 visitors in 1970 and that this number would increase to 930,000 annually by the year 2070. The project includes facilities to meet this expected recreational use.

b. Recreation Benefits

Based on the foregoing anticipated usage, and computing annual return on a present worth basis, annual benefits to recreation total \$410,000. Further details concerning recreational development are contained in Appendix A.

12. Low-Flow Augmentation and Pollution

The Sugar River is presently polluted and the waters are unsuitable for all-purpose recreational usage. It is anticipated that project design and construction will hasten the adoption of those pollution abatement measures necessary to improve water quality to enable water-oriented recreation pursuits by the time construction is completed. See letter of 9 November 1964 from New Hampshire Water Pollution Commission. Operation of the recreation pool after the recreation season will provide about 10,000 acre-feet of water for low-flow augmentation and water quality purposes during the fall season. Benefits from this operation will be determined by the U.S. Public Health Service at a later date since future water quality benefits from storage releases depend on local action for improvement of upstream water quality. Any benefits from improved hydro-electric generation at existing downstream plants would be wholly incidental to other uses and would be minor.

13. Hydroelectric Power

The permanent pool proposed is at elevation 566 feet, m. s. l. With tailwater elevation 520 feet, m. s. l., the maximum head available during the fall and winter months would be about 46 feet. The average annual flow at the site is 387 c. f. s. and the minimum recorded flow is 30 c. f. s. as regulated by discharges from Sunapee Lake. Since there would be no storage at the site other than that contained in the recreation pool, any power installation would be operated on a run-of-the-river basis. The amount of dependable power possible under these conditions is small, and it is concluded that an initial power installation is not warranted. This would not preclude the addition of generating facilities at a later date if found warranted.

14. Recommended Project Plan

a. General. The Claremont Dam and Reservoir project considered herein is a multiple-purpose project providing 68,400 acre-feet of flood control storage, 10,000 acre-feet of joint-use storage for flood control and recreation lying between elevations 580 and 566 feet, m. s. l. and a permanent recreation pool at elevation 566 feet, m. s. l. during the late fall, winter and spring months and at elevation 580 feet during the summer recreational season.

b. Storage Allocation. Reservoir operating procedures establish a recreation pool at the start of the summer season at elevation 580 feet, m. s. l. This elevation is ideally suited for recreation purposes and drawdown of up to five feet can be tolerated if necessary for downstream low-flow regulation. During the summer, the portion of the reservoir between elevations 580 and 638, consisting of 68,400 acre-feet would be reserved for flood control. In September, at the close of the recreation season, the pool would be drawn to elevation 566 releasing 10,000 acre-feet in the normally dry period. During the late fall, winter and spring periods the reservoir between elevations 566 and 638 feet would be reserved for flood control purposes. This represents 78,400 acre-feet equivalent to six inches of runoff from the tributary drainage area.

The dam would be an earth fill structure 2700 feet long and 138 feet high. At spillway crest elevation 638 feet, m. s. l., the reservoir would cover an area of 1520 acres. The spillway and outlet structures would be located in the left abutment. About 2.9 miles of State highway and 1.9 miles of town road including utilities paralleling the rights-of-way would be relocated. The Claremont and Concord Railroad traverses the site. Sections of this line east of Newport have been abandoned in recent years and it is anticipated that the rights to the line between Claremont and Newport would be purchased.

15. Cost Estimate

The estimated first cost and annual charges for the project considered herein are shown below.

<u>Item</u>	<u>FIRST COST(Dec. 1964 Price Level)</u>
	<u>Cost</u>
Lands and damages	\$ 1,900,000
Relocations	1,900,000
State Road (\$1,000,000)	
Town roads (400,000)	
Railroad (250,000)	
Utilities (250,000)	
Reservoir	100,000
Dam	7,220,000
Recreation facilities	1,632,000
Bldgs., grounds and utilities	80,000
Permanent Operating Equipment	30,000
Engineering and Design	1,158,000 ^{1/}
Supervision and Administration	<u>800,000</u>
Total Project Cost	\$ 14,820,000

^{1/} Includes \$237,000 expended to date

CLAREMONT FIRST COST

<u>Item</u>	<u>Single-Purpose Flood Control</u>	<u>Recreational Modifications</u>	<u>Multi- Purpose</u>
Lands	\$ 1,880,000	\$ 20,000	\$ 1,900,000
Relocations	1,900,000	-	1,900,000
Reservoir	40,000	60,000	100,000
Dam	6,900,000	320,000	7,220,000
Recreation facilities	-	1,632,000	1,632,000
Bldgs., grounds and utilities	80,000	-	80,000
Permanent Oper. equipment	30,000	-	30,000
Engineering and design	1,158,000	-	1,158,000
Supervision and Ad- ministration	<u>800,000</u>	<u>-</u>	<u>800,000</u>
Total	\$ 12,788,000	\$ 2,032,000	\$ 14,820,000

Investment and Annual Costs (1964 Price Level)

Investment

Total First Cost	\$ 14,820,000
Interest During Construction	<u>690,000</u>
Total Investment	15,510,000

Annual Costs

Interest on Investment	\$ 485,000
Amortization (100 years)	23,000
Operation & Major Replacements	78,200
Net Loss of Productivity	4,300
Tax Loss on Land	<u>4,000</u>
Total Annual Costs	\$ 594,500

Summary of Annual Benefits
(1964 Price Level)

<u>Nature of Benefits</u>	<u>Annual Benefits</u>
Flood Damage Reduction	\$ 618,000
Recreation	410,000
Low-flow regulation	Negligible
Water Quality Improvement	To be determined after further study

Total Average Annual Benefits - \$1,028,000

16. Economic Justification

A comparison of the total evaluated annual benefits of \$1,028,000, with project annual costs of \$594,500, gives a benefit-cost ratio of 1.7 to 1.0 for the project. Other prospective benefits from water quality improvement possible through regulation of the recreation pool will be determined at a later date by the U.S. Public Health Service.

17. Real Estate

In accordance with EM 405-2-150, the planned real estate acquisition includes the fee purchase of the dam site, work areas, and the reservoir area to full pool elevation 638 feet, m. s. l., plus a minimum horizontal distance of 300 feet. In addition, approximately 1630 acres, left without access, would be purchased. Pertinent real estate data is shown below:

REAL ESTATE AREAS

(Does not include lands required for highway relocation)

	<u>Dam Site & Work Area</u> (acres)	<u>Res. Area</u> (acres)	<u>Recr. Area</u> (acres)	<u>Land left without Access</u> (Acres)	<u>Total</u> (Acres)
Industrial	20	15	-	-	35
Commercial	20	30	-	-	50
Developed residential	-	60	-	-	60
Undeveloped residential	50	-	-	-	50
Gravel Pit	10	-	-	-	10
Farm sites	-	25	-	-	25
Tillage	-	900	-	-	900
Pasture	-	750	-	-	750
Woodland	-	240	100	1630	1970
Total	100	2020	100	1630	3850

The land to be acquired in fee is presently improved with 92 sets of buildings classified as follows:

Residential	51
Agricultural	27
Commercial	12
Industrial	1
Camps	<u>1</u>
Total	92

The gross appraised value of the land with improvements, resettlement costs, severance damages and the cost of acquisition including a reasonable allowance for contingencies is \$1,900,000.

18. Relocations

Construction of the project will require the relocation of 2.9 miles of New Hampshire State Highway routes 11 and 103. The relocated highway would be situated along the northern rim of the reservoir. A portion of the existing route would be utilized for access to the recreational pool. A town road designated Unity Road would be relocated for about 1.9 miles. The relocated section would provide access to the major recreational area situated on the south side of the proposed recreational pool.

Utilities located on the highway rights-of-way and including electric and telephone service would be relocated along the relocated highway rights-of-way.

The Claremont and Concord Railroad Company maintains freight service between Claremont and Newport, New Hampshire. In recent years, the section of railroad between Newport and Concord, New Hampshire has been abandoned partially due to economic reasons and partially due to the construction of the Hopkinton-Everett Reservoir project on the Contoocook River. Present traffic between Claremont and Newport appears sufficient to warrant continued operation of the line at minimum economic return. It appears that the Railroad Company will negotiate a settlement for abandonment of the remaining portion upon construction of the Claremont project.

19. Local Cooperation and Reservoir Management

a. Local Cooperation

All project benefits are considered general in character. The cost of constructing the dam and reservoir and appurtenant facilities would be wholly at Federal expense. This is in accordance with the authorization for the project. As a test, the new cost sharing policy for recreational development at Federal reservoirs as set forth in H. R. 9032 has been computed. As applied to the Claremont project, none of the project costs would be reimbursable and no local participation would be required.

b. Reservoir Management

It is contemplated that developed recreation areas would be operated, maintained, and managed by the State of New Hampshire under a long-term lease, in accordance with Section 4 of the Flood Control Act of 1944 (P. L. 78-534) as amended by Section 207 of Public Law 87-874, the Flood Control Act of 1962, and as further amended by the "Land and Water Conservation Fund Act of 1965" (Public Law 88-578).

For the remainder of the reservoir area, management by the State in the interest of fish and wildlife will be sought.

Operation, maintenance and management of the dam and water control facilities will be solely a Federal function.

20. Discussion

The restudy of the Claremont project indicates its high value for reducing downstream flood damages. The restudy also indicates that the reservoir area has great potential for recreational use. The New Hampshire Water Pollution Commission indicates that pollution abatement measures will be taken to enable the use of the reservoir area for all types of water-oriented recreation. Construction of the project for flood control and recreation is amply justified with a benefit-cost ratio of 1.7 to 1.0.

21. Recommendation

Subject to the concurrence of the Governor of the State of New Hampshire in project construction, it is recommended that the project be reclassified from "deferred for restudy" to "active" to permit consideration to be given to early project construction.

The State of New Hampshire



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New Hampshire Water Pollution Commission

61 South Spring Street

Concord

03301

November 9, 1964

WILLIAM A. HEALY
TECHNICAL SECRETARY
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POLLUTION ENGINEER
CLARENCE W. METCALF
DIRECTOR OF
MUNICIPAL SERVICES

Mr. John Wm. Leslie
Chief, Engineering Division
U. S. Army Engineer Division, New England
424 Trapelo Road
Waltham, Massachusetts

Re File No. NEDED-R

Dear Mr. Leslie:

This will acknowledge receipt of your letter of November 6, 1964, regarding a potential use of the Claremont Dam and Reservoir project for recreational purposes.

As indicated in your letter, the present quality of the stream would not allow for safe bathing conditions. However, in due time control of present sources of pollution will be required. If recreational use is desired, in our opinion, sufficient treatment of the existing sewage and waste discharges can be provided so as to accommodate for this type of activity.

The present schedule would indicate that classification recommendations for the Sugar River will be submitted to the Legislature within the next eight to ten year period.

If we can be of further service, please feel free to contact us.

Very truly yours,

A handwritten signature in cursive script, appearing to read "William A. Healy".
William A. Healy
Technical Secretary

WAH/db

APPENDIX A

EVALUATION OF RECREATION POTENTIAL

CLAREMONT RESERVOIR
NEW HAMPSHIRE

CONNECTICUT RIVER FLOOD CONTROL

January 1965

APPENDIX A

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CLAREMONT RESERVOIR, N. H.

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APPENDIX A

EVALUATION OF RECREATION POTENTIAL CLAREMONT RESERVOIR, N. H.

I. INTRODUCTION

Funds were appropriated by Congress for a review of the Claremont Dam and Reservoir, an authorized flood control project on the Sugar River, upstream of Claremont, New Hampshire. The restudy was made to determine the need for economic justification and present local interest in the project.

During the restudy made in 1964, previous studies of the Claremont site have been updated and a new cost estimate prepared based on the latest engineering criteria.

With the ever-increasing demand for recreational pursuits, opportunities exist at this site for full consideration of outdoor recreation potential and fish and wildlife enhancement. This Appendix evaluates the recreation potential of the Claremont Dam and Reservoir in relation to existing and planned Federal, State or local public recreation developments, and presents estimates of development costs and modification costs, annual visitation, recreation benefits, and associated information.

II. DESCRIPTION OF PROJECT

2-01. Authorized Purpose of Project

The Claremont Reservoir was authorized by the Flood Control Act of 1938 (Public Law 761, 75th Congress, 3rd Session) as modified by the Flood Control Act of 1941 (Public Law 228-77th Congress) and the Flood Control Act of 1944 (Public Law 534, 78th Congress) 2nd Session. The Claremont Reservoir is a unit of the comprehensive plan for flood control in the Connecticut River Basin.

2-02. General

The Claremont Dam, as modified to include recreational development and flood control storage, would be 138 feet high, 2,700 feet long, contain a 860-acre permanent pool at elevation 580.0 feet, m. s. l. and

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have a flood storage capacity of 78,400 acre-feet, equivalent to six inches of runoff from its drainage area of 245 square miles. The Claremont project will provide substantial flood damage reductions downstream in New Hampshire, Vermont, Massachusetts and Connecticut. In addition, the reservoir will also provide benefits from other multiple uses of the recreation and fish and wildlife resources of the project.

2-03. Description of the Reservoir Area

Reservoir land which would be acquired for the project is estimated at 3,850 acres, which includes about 2,120 acres for reservoir purposes, 100 acres for project construction and operation, and 1,630 acres of properties left without access.

The Claremont Reservoir is located in the foothills of the Green Mountain mass on the north, and the Unity Mountain mass on the south. The summits of these mountains, situated about $2\frac{1}{2}$ miles north and south from the river, rise to heights of about 1500 feet above the conservation pool.

The reservoir area is characteristic of generally rough relief found throughout the Sugar River Valley, with open valley floors of varying widths and steep forested hillsides. The slope of the river averages about 30 feet per mile.

At spillway crest, elevation 638 feet, m. s. l., the reservoir is irregular in shape extending east about $3\frac{1}{2}$ miles up the Sugar River with an arm extending south for about $1\frac{3}{4}$ miles up Spring Farm Brook. About 65 percent of the area is wooded, 22 percent in water area with the conservation pool, 10 percent in open field and the remainder in rivers, streams and roads. The woodland area is chiefly covered with a mixed growth of hardwood with some hemlock, pine, cedar and spruce. Most of the cleared land is classified as tillage and was used either to produce hay or for pasturage.

2-04. Climate

The average temperatures for January and July in the vicinity of the project are 17.7 degrees F. and 68.7 degrees F., respectively.

Freezing temperatures begin about the end of October and end about the middle of April. The summer season, when the maximum daily temperatures are 70°F. or higher, last from late May to early September. Precipitation for the year averages about 38 inches and is well distributed among the seasons. The average annual snowfall is about 67 inches between the months of November to April.

III. PROJECT RESOURCES

3-01. Suitability of Reservoir Area for Recreational Use

The construction of the Claremont Dam would create a scenic water body at elevation 580 feet, m. s. l. that would be approximately three miles long, have a maximum width of about one mile, and encompass an area of about 860 acres.

The average depth of the pool so created would be 25 feet with about 85 percent of the pool having depths of greater than 10 feet and 20 percent having depths of greater than 40 feet. This man-made lake with about $7\frac{1}{2}$ miles of shoreline would be almost completely surrounded by forested mountains and rolling hills. Certain portions of the shoreline would lend themselves to intensive recreation development. Other areas would provide outstanding scenic overlooks encompassing a wide panorama of water and mountains.

The southern shoreline with gentle slopes, open land areas and wooded knolls overlooking the pool is ideally suited for a major day-use area and readily adaptable for beach and picnic development. Existing roads provide access to much of the area. The northern shoreline with steeper slopes, large open areas and greater water depths is well suited for boating development. Lands above spillway crest in the southern portion of the project are ideal for camping developments, hiking trails, nature study and scenic overlook areas, the major sites being at Pike Hill, Alden Hill and the hill northeast of Pike Hill. Existing roads leading to these sites require little improvement and provide ready access. The reservoir lies on the main road between Claremont and Lake Sunapee and Mt. Sunapee State Park. The annual average 24-hour traffic in 1962 along this route was 4,500 cars. Visitation to Mt. Sunapee State Park is about 200,000 annually. A major portion of the visitation now pass through the proposed reservoir site. If constructed, this water resource project would not compete with Mt. Sunapee State Park recreation as the major attraction of Mt. Sunapee is skiing (winter attendance 1963 was about 140,000). The Claremont project would actually supplement the facilities at Mt. Sunapee State Park by creating a large panoramic public water area in a region where public water based recreation opportunities are limited.

3-02. Fish and Wildlife Resources

In January 1962, the U. S. Fish and Wildlife Service submitted their preliminary report for the Claremont Reservoir which stated that there were no significant fish and wildlife values within the reservoir. This evaluation, however, was based on a single-purpose flood control project with no permanent pool and the fact that the Sugar River is presently polluted from both industrial and domestic origin. A new study of the potential resources will be made by the U. S. Fish and Wildlife Service assuming a permanent pool and the provision of necessary pollution abatement measures which are being actively sought by the State to assure suitable water quality.

3-03. Forestry, Historical and Archeological Resources

These and other resources of the area will be evaluated by the appropriate agencies and will be included in the plan of development for the Claremont Reservoir.

3-04. Water Resources

Present water quality in the Sugar River at the site is unsuited to recreational usage. The waters at the reservoir site correspond to Class D waters identified by the New England Interstate Pollution Control Commission as suitable for the transportation of sewage and industrial waste without nuisance. With abatement measures in the stretch of the Sugar River above Claremont, the project will provide a valuable recreational asset to New Hampshire and the entire region. Solution of the pollution problem is progressing under State leadership and future improvement of water quality in the Sugar River is virtually assured.

IV. FACTORS INFLUENCING RESERVOIR DEVELOPMENT

4-01. Region Served

The Claremont Reservoir zone of influence is based on a consideration of existing facilities for water recreation in the region, location of population centers, accessibility, and vacation and tourist trends within a 100-mile radius. The zone is further broken down into the 15-mile radius and 50-mile radius on the basis that residents within the inner zones may be expected to use the reservoir facilities more frequently. (See zone of influence map, Plate 1).

4-02. Population

The number of persons residing within the zone of influence of Claremont Reservoir according to the 1960 census and the projected population for 1970, 2000, 2020 and 2070 are shown in Table 1 on the following page.

4-03. Income

The median income of families within a 15-mile radius of Claremont Reservoir in 1960 was \$5,200, with 72% of the families with incomes between \$3,001 and \$9,999 and 9% with incomes of over \$10,000. Median family incomes of the 100-mile zone of influence were somewhat higher. The median family income of the 100-mile zone was about \$6,000 with 70% of the incomes between \$3,001 and \$9,999 and 15% with incomes over \$10,000. 1/

Participation in outdoor activities increases with income, the increase is the sharpest at about \$3,000 a year, from there on the participation steadily increases reaching a maximum in the \$7,500-10,000 bracket then declining slightly thereafter. 2/

4-04. Education

Of all persons 25 years old and over within the 100-mile zone of influence of the Claremont Reservoir the median number of school years were over 11. 1/ Education affects recreation participation much as income, - the more education, the more activity. 2/ The percentage of persons participating in outdoor activities is higher among the group with more than three years of high school.

4-05. Employment

Occupation has a considerable influence on participation in outdoor activities. The greatest participation is by the non-labor force. Among occupations, professional people enjoy the most recreation and farm workers the least. Within the Claremont zone of influence about 60 percent of the population belonged to the non-labor force. Of the employed labor force, about 42 percent were in white collar occupations and about 38 percent were in manufacturing industries. 1/

1/ U. S. Dept. of Commerce, Bureau of the Census

2/ ORRRC Main Report 1962

TABLE 1

POPULATION PROJECTIONS
WITHIN 100-MILE RADIUS

CLAREMONT RESERVOIR, NEW HAMPSHIRE

ZONE- STATE	POPULATION - YEAR				
	1960	1970	2000	2020	2070
<u>15-Mile Radius</u>					
New Hampshire	28,000	31,000	47,000	64,000	121,000
Vermont	<u>22,500</u>	<u>22,000</u>	<u>30,000</u>	<u>39,000</u>	<u>68,000</u>
Total	50,500	53,000	77,000	103,000	189,000
<u>50-Mile Radius</u>					
New Hampshire	215,400	240,000	360,000	490,000	930,000
Vermont	102,100	99,000	138,000	180,000	370,000
New York	7,600	8,000	13,000	18,000	35,000
Massachusetts	<u>11,500</u>	<u>12,000</u>	<u>18,000</u>	<u>24,000</u>	<u>44,000</u>
Total	336,600	359,000	529,000	712,000	1,379,000
<u>100-Mile Radius</u>					
New Hampshire	600,000	670,000	1,000,000	1,370,000	2,600,000
Vermont	345,000	340,000	450,000	585,000	1,020,000
Maine	128,000	137,000	198,000	266,000	490,000
New York	880,000	985,000	1,500,000	2,080,000	4,050,000
Massachusetts	<u>2,920,000</u>	<u>3,036,000</u>	<u>4,400,000</u>	<u>5,900,000</u>	<u>10,900,000</u>
Total	4,873,000	5,168,000	7,548,000	10,201,000	19,060,000

4-06. Leisure Time

In special studies conducted by the Bureau of Labor, statistics confirm the trend toward a shorter than 40-hour week. All figures point to a continuation of this trend into the future. More time will be available to participate in outdoor recreation. This increase will bring greater pressure upon existing facilities. It will also increase the demand for expansion of existing facilities and the development of new recreation facilities. As much as 20 percent of the leisure time, based on a 40-hour week, has some part focused upon areas with public outdoor recreation facilities. Greater opportunity is needed close to Standard Metropolitan Statistics Areas of New England(see Plate 2) to meet the mounting needs and demands of the majority of residents who are primarily skilled wage earners. With a 860-acre lake adequately developed a substantial part of the demand can be satisfied in the afterwork and weekend hours at the Claremont Reservoir area.

4-07. Accessibility

The accessibility of the reservoir to cities and towns within the zone of influence is indicated on Plate No. 1. The highway distance and travel time from the dam to several of the populated centers in the zone of influence are listed on Table 2.

Two major interstate highways, U.S. Routes No. 91 and 89, will pass within four miles and eight miles, respectively, of the reservoir area. In addition, state North-South roads 10, 11, & 12 pass within two miles of the area. The major east-west road into the reservoir area is state Route 11 & 103 which passes through the reservoir area. With the completion of the Major Interstate Highways 91, 93 and 89, travel time from many centers in southern New England to New Hampshire and Vermont will be reduced by at least 25%. Completion of these main arteries is progressing with many sections already in use. At the present time with only a portion of Interstate 93 and 89 complete, travel time from Boston to Claremont is approximately two hours and 20 minutes, a saving of about 20 minutes from the time shown in Table 2.

4-08. Tourist and Vacation Trends

Tourists and vacationers play a major roll in the economy of the project area for the states of New Hampshire and Vermont as a whole. Reflecting the importance of recreation to the New Hampshire and Vermont economy, and indicative of the growing demand for recreational opportunities, are figures compiled by the American Express Travel survey which showed that vacationists put \$244,000,000 and \$125,000,000 in the New Hampshire and Vermont economy in 1961, respectively. The survey also estimated that in 1962 the rate would increase about 10%. Statistics by the state of New

TABLE 2
ACCESSIBILITY

<u>City, State</u>	<u>1960 Population</u>	<u>Highway Distance from Dam</u>	<u>Driving Time at 45 MPH Ave.</u>
1. Claremont, N. H.	13,563	2 miles	5 min.
2. Newport, N. H.	3,222	8 miles	10 min.
3. Springfield, Vt.	6,600	18 miles	25 min.
4. Brattleboro, Vt.	9,315	43 miles	55 min.
5. Rutland, Vt.	18,325	48 miles	1 hr.
6. Concord, N. H.	28,991	53 miles	1 hr. 10 min.
7. Manchester, N. H.	88,282	63 miles	1 hr. 20 min.
8. Bennington, Vt.	8,023	84 miles	1 hr. 50 min.
9. Portsmouth, N. H.	25,833	98 miles	2 hrs. 10 min.
10. Springfield, Mass.	174,463	100 miles	2 hrs. 10 min.
11. Worcester, Mass.	186,587	104 miles	2 hrs. 20 min.
12. Pittsfield, Mass.	57,879	115 miles	2 hrs. 35 min.
13. Burlington, Vt.	35,531	117 miles	2 hrs. 40 min.
14. Boston, Mass.	697,938	118 miles	2 hrs. 40 min.
15. Albany, N. Y.	129,726	122 miles	2 hrs. 40 min.
16. Hartford, Conn.	162,178	125 miles	2 hrs. 45 min.
17. Berlin, N. H.	17,821	136 miles	3 hrs.
18. Providence, R. I.	207,498	144 miles	3 hrs. 10 min.
19. Augusta, Maine	21,680	194 miles	4 hrs. 20 min.
20. New York City, N. Y.	7,781,984	237 miles	5 hrs. 10 min.

Hampshire showed that in 1958-1959 two out of every three persons using day-use type parks were non-residents. Vermont officials stated that about 50 percent of summer day-use and that over 70 percent of camping was by out-of-state residents and that visitors to the ski slopes outnumbered residents three to one.

4-09. Existing Park and Recreation Areas

Public-use areas within the 50-mile zone of influence were investigated to determine facilities available, present and future capacity and trends in visitation.

Within the 50-mile radius of the Claremont zone of influence, encompassing parts of three states, there are 20 Federal and 28 state public recreation areas of varying extent. (See Plate No. 3). Certain of these existing areas are located on lakes and provide facilities for water recreation. It is recognized that these public recreation areas will continue to provide needed recreation facilities to the public. However, it is expected that the Claremont Reservoir will offer new recreational opportunities to supplement these existing facilities and that increased use of all available developments for water recreation will result.

Many of the existing recreation areas are over-used. Attendance figures over the past decade at State Parks indicate that many have reached a point of saturation and the visitations have levelled off or even dropped. Public-use areas recently provided at Federal Flood Control projects within the area already show over-use of existing facilities. (See Table 3).

A study of attendance figures for the period 1951 to 1963 at public-use areas within the State of New Hampshire indicated that visitation has increased from 1,280,178 to 2,687,780. (See Plate No. 4). However, many areas have reached maximum development with no further room for expansion and as a result these areas have reached saturation. Where additional facilities had been added or new areas developed, an immediate marked increase in attendance was noted at the new or expanded area with little or no change of attendance at areas where no improvements were made.

4-10. Anticipated Public Use

The procedure used in estimating annual attendance on the basis of a percentage of population within a given zone of influence is an accepted method used by the National Park Service. The percentage used is assumed, after consideration of all known factors such as accessibility, existing recreation facilities and tourist and vacation trends within the region. (See Plate No. 5). The estimate of annual attendance at Claremont Reservoir shown in Table 4 and Plate No. 6 is believed to be conservative, based on attendance records at other completed Corps of Engineers' reservoirs and State Parks and are determined as follows:

TABLE 3
PUBLIC USE AT
EXISTING CORPS OF ENGINEERS PROJECTS
WITHIN 50 MILE RADIUS
CLAREMONT RESERVOIR, NEW HAMPSHIRE

Project	Distance from Dam (miles)	Recorded Annual Attendance (Visitor-Days)				Annual ⁽²⁾ Capacity of Facilities 1964	Percent ⁽³⁾ of Overuse
		1963		1964			
		Total ⁽¹⁾	Public Use Areas	Total ⁽¹⁾	Public Use Areas		
North Springfield, Vt.	10	311,900	165,400	219,600	122,700	30,000	310
North Hartland, Vt.	18	106,900	87,300	114,700	93,000	80,000	16
Surry Mountain, N. H.	26	41,000	20,800	59,100	36,100	20,000	80
Ball Mountain, Vt.	29	40,700	5,500	41,700	2,500	13,000	- 80
Blackwater, N. H.	30	7,400	3,200	6,800	3,000	3,000	0
Townshend, Vt.	30	226,900	195,000	166,000	145,000	30,000	385
Otter Brook, N. H.	32	58,100	21,200	81,300	46,000	45,000	0
Union Village, Vt.	35	20,500	13,200	31,200	24,600	5,000	390
Franklin Falls, N. H.	35	37,400	12,200	25,900	17,300	5,000	245
Hopkinton-Everett, NH	35	74,300	41,700	169,600	92,000	80,000	15
Edward McDowell, NH	37	22,600	5,000	7,600	5,000	5,000	0
Tully, Mass.	50	22,600	11,800	17,800	9,400	7,000	34
Birch Hill, Mass.	50	224,000	213,300	186,400	180,000	75,000	140

(1) Includes sightseers and visitors at the dam.

(2) Capacity based on actual day use facilities available in 1964 using criteria in Section V, paragraph 5-04

(3) Ratio of 1964 recorded annual attendance, not including sightseers and visitors at dam to the annual capacity.

TABLE 4

ESTIMATED VISITATION
(100-Year Life)

CLAREMONT RESERVOIR, N. H.

ANNUAL VISITS - YEAR

<u>ZONE</u> <u>DISTRIBUTION</u>	<u>1970</u>	<u>1995</u>	<u>2020</u>	<u>2070</u>
From 15 miles	53,000	73,000	103,000	189,000
From 16-50 miles	78,000	107,000	152,000	301,000
From 51-100 miles	<u>96,000</u>	<u>134,000</u>	<u>190,000</u>	<u>355,000</u>
Zone Total	227,000	314,000	445,000	845,000
Tourists and Vacationers	<u>23,000</u>	<u>31,000</u>	<u>45,000</u>	<u>85,000</u>
Total Estimated Annual Visitation (Visitors-days)	250,000	345,000	490,000	930,000

a. Day-Use

(1) It is anticipated that the annual attendance from the 15-mile zone will equal the population within this area.

(2) It is anticipated that the annual attendance from the 16-50 mile zone will equal 25% of the zone population.

b. Weekend and Vacation Use

It is estimated that 2% of the population residing within the 51-100 mile zone of influence will use the facilities annually.

c. Tourist and Vacationers

It is estimated that 10% of the estimated attendance should be added to represent tourist and vacationers.

V. DEVELOPMENT PLAN

5-01. General

The proposed location of public-use areas, camping areas and boating areas for initial and future development are shown on Plate No. 7. The selection of public-use sites is based primarily on quality of access to the reservoir shoreline and existing or potential access roads. The plan of development has been proposed based on the suitability of the resources of the area as discussed in paragraph 3-01.

5-02. Land Allocation

The tentative allocation of project lands for various purposes, such as (1) initial public use areas; (2) future public-use areas; (3) Wildlife management areas; and (4) Forestry Management areas is shown on Plate No. 7. Other uses will be considered and designated at such time when studies of other agencies are received or specific requests made.

5-03. Extent of Development

The method used in determining the extent of recreation development was the "design load method." This procedure employs the use of the empirical formula $\frac{1}{14} \frac{(AV \times 80\%) \times 60\%}{1.5}$ * to derive from the estimated annual

* AV - Annual attendance

80% - Percent of attendance that will use facilities during normal season of 14 weeks.

60% - Percent of weekly visitors on a normal summer Sunday

1.5 - Rate of turnover on use of facilities on a normal summer Sunday

visitor-days the use expected at any one time on a normal summer Sunday and is the number for which facilities would be needed. The estimated annual visitation does not include sight-seeing and visitors at the dam.

The design load for the initial and future development and the average annual increase in attendance over the life of the project is shown in Table No. 5.

5-04. Facilities Required

The number of facilities required was determined as follows:

- a. Picnic Facilities - 40% of the design load at the rate of 10 people per unit of 2 tables and 1 fireplace.
- b. Swimming Area - 55% of the design load at 150 square feet per person.
- c. Sanitary Facilities - 100% of the design load with 1 urinal and 5 water closets per 320 people.
- d. Parking Facilities - 80% of the design load at the rate of 4 people per car.
- e. Water Facilities - 100% of the design load at the rate of one faucet per 75 visitors.
- f. Camping Facilities - 10% of the design load with 5 people per campsite. Campsite includes picnic tables, fireplace, parking space, and site preparation.
- g. Boating & Fishing Facilities - 15% of the design load with an access unit consisting of a boat ramp and a parking area for 40 cars and trailers.
- h. Administration Unit - Where indicated includes residences, maintenance garage, workshop, equipment storage building and utilities.
- i. Roads - Where determined by study of topographic maps.
- j. Trail Facilities - Where desirable.

TABLE 5

ESTIMATED NEEDS FOR DAY-USE FACILITIES

CLAREMONT RESERVOIR, N. H.

	<u>Estimated Annual Attendance</u> (Visitor -Days)	<u>Design Load Equivalent</u> (Visitors)
Initial Development (1970)	250,000	5,700
Future Development (1970-2070)	<u>680,000</u>	<u>15,600</u>
Total Development	930,000	21,300
<u>Ave. Annual Increase</u>		
1970-1995	3,700	85
1996-2020	6,100	140
2021-2070	8,700	200

5-05. Cost of Development

The type and costs of facilities is based on the cost of developing similar installations at existing Federal reservoirs, State Parks and recreation areas and are based on the 1964 price level.

Future development would require facilities to accommodate an estimated additional annual attendance of 680,000 visitor-days by the final year of project life. These facilities would be added on a planned program necessary to accommodate the expected increase in attendance. Certain facilities provided in the initial development such as principal access roads, administrative unit and water supply systems would not be included in the cost of future needs.

The preliminary estimate of cost of the Initial Development for Public Use is given in Table 6.

TABLE 6

PRELIMINARY ESTIMATE OF COST FOR DEVELOPMENT

FOR PUBLIC USE

CLAREMONT RESERVOIR, NEW HAMPSHIRE

INITIAL DEVELOPMENT
DAY USE-PARK AREA

<u>Item</u>	<u>Quantity</u>	<u>Unit Price</u>	<u>Estimated Cost</u>
Roads - Dbl. Bit. Treatment	4.0 mi.	\$ 25,000	\$ 100,000
Parking Areas	38,000 s. y.	2.00	76,000
Beach Development	53,900 s. y.	1.25	70,000
Picnic Tables	456 ea.	90.00	41,000
Fireplaces	228 ea.	75.00	17,100
Trash Barrels	456 ea.	10.00	4,500
Sanitary Facilities			
1 central change house toilet structure at beach area, with provisions for mana- gement and storage facilities, 30 change stalls, 30 water closets & 6 urinals. Flush- type toilets	Job	150,000	150,000
6 toilet units with 1 urinal & 5 water closets each	6 each	20,000	<u>120,000</u>
DAY-USE AREA TOTAL			\$ 578,700

CAMPING AREATABLE 6 (cont'd)

<u>Item</u>	<u>Quantity</u>	<u>Unit Price</u>	<u>Estimated Cost</u>
Roads - Dbl. Bit. Treatment	0.5 mi.	\$ 25,000	\$ 12,500
Gravel Surface	1.5 mi.	15,000	22,500
Campsite	114 ea.	200.00	22,800
Picnic Tables	114 ea.	90.00	10,300
Fireplaces	114 ea.	75.00	8,500
Trash Barrels	228 ea.	10.00	2,300
Toilet structure-with 1 urinal & 5 water closets, 2 shower stalls and 1 laundry tub each.	4 ea.	22,000	<u>88,000</u>
Camping Area Total			\$ 166,900

BOAT LAUNCH & MARINA AREA

Parking Area	3,000 s. y.	2.00	6,000
Boat Launch Ramp	1 ea.	5,000	5,000
Building w/2 toilets and office space -20'x28'	1 ea.	10,000	10,000
Mooring Facilities	1 ea.	4,000	<u>4,000</u>
Boat Launching & Marina Area Total			\$ 25,000

ADMINISTRATION & MAINTENANCE AREA

(TABLE 6 cont'd)

<u>Item</u>	<u>Quantity</u>	<u>Unit Price</u>	<u>Estimated Cost</u>
Entrance Station-10' x 10'	1 ea.	4,000	4,000
One 4-tall garage w/office, toilet & work shop	1 ea.	15,000	<u>15,000</u>
Administration & Maintenance Area Total			\$ 19,000

CENTRAL WATER SUPPLY SYSTEM

	1 job	70,000	70,000
<u>TRAILS</u>	4 mi.	2,500	10,000
<u>LANDSCAPING</u>	1 job	9,000	9,000

SIGNS & MARKERS

(material only - work done in NED workshop)	1 job	1,000	<u>1,000</u>
Total Construction Cost			\$ 879,600
Contingencies (15%)			132,000
Engineering & Design (10%)			101,200
Supervision & Administration (8%)			<u>87,200</u>
TOTAL COST - INITIAL DEVELOPMENT			\$ 1,200,000

VI. ECONOMIC EVALUATION

6-01. Investment Costs

The estimated first cost of the recreational development for the Claremont Reservoir includes allowances for contingencies, engineering and design and for supervision and administration and are based on 1964 price levels. Included in the investment costs are specific development costs and the joint-use costs which include reservoir clearing and project modification costs. The estimated investment costs are given in Table 7.

TABLE 7

INVESTMENT COSTS OF PUBLIC USE DEVELOPMENT
Claremont Reservoir, N. H.

	<u>INITIAL</u>	<u>FUTURE</u> (deferred costs)	<u>TOTAL</u>
Project Modification Cost \$	320,000	-	\$ 320,000
Reservoir Clearing	60,000	-	60,000
Land	<u>20,000</u>	-	<u>20,000</u>
Sub-total	400,000	-	400,000
Development Cost (incl. Cont., E&D, S&A)	<u>1,200,000</u>	<u>432,000</u>	<u>1,632,000</u>
Total	\$ 1,600,000	\$ 432,000	\$ 2,032,000

6-02. Annual Costs

The estimates of annual charges include interest and amortization at a 3-1/8% interest rate over the economic life of the project estimated at 100 years, operation and maintenance over the 100 years of project life at a charge of \$0.10 per visitor annually, and allowance for major replacement which includes replacing 1/3 of the facilities every 25 years. The estimated annual charges are given in Table 8.

Table 8

ANNUAL COSTS OF PUBLIC-USE DEVELOPMENT

	<u>INITIAL</u>	<u>FUTURE</u> (deferred costs)	<u>TOTAL</u>
Total Investment	\$ 1,600,000	\$ 432,000	\$ 2,032,000
Interest on Investment (0.03125)	50,000	13,500	63,500
Amortization (0.00151)	2,400	700	3,100
Maintenance and Operation	25,000	16,000	41,000
Allowance for major Replacements	<u>6,100</u>	<u>4,100</u>	<u>10,200</u>
Total Annual Costs	\$ 83,500	\$ 34,300	\$ 117,800

6-03. Annual Benefits

The average annual recreation benefits over the life of the project (100 years) are estimated at \$410,000. These benefits were based on assigning a monetary rate of \$1.00 per visitor-day to the average annual equivalent attendance expected at the project over 100 years. This rate represents a weighed average visitor-day value for such recreation activities as picnicking, swimming, fishing, boating, camping, sight-seeing, nature study and other outdoor pursuits. To arrive at the average annual recreation benefits for the project, this rate was applied to the total average annual equivalent attendance over the life of the project.

It is estimated that upon completion of the initial development, the annual attendance would be about 250,000 visitor-days, and that with future development throughout the life of the project the annual visitation would steadily increase to 930,000 or an increase of 680,000 visitor days. The increases are assumed to be greater in the latter years of the project so that the benefits are based on a deferred growth from 250,000 to 930,000 visitor-days in the final year of project life. The average annual equivalent benefit for this growth, computed at 3-1/8% interest rate for 100 year period is \$240,000. (680,000 (visitor-days) x 0.235 (ave. ann. eq. factor) x \$1.00/(visitor days) = \$160,000 (ave. ann. equiv. benefits for growth).

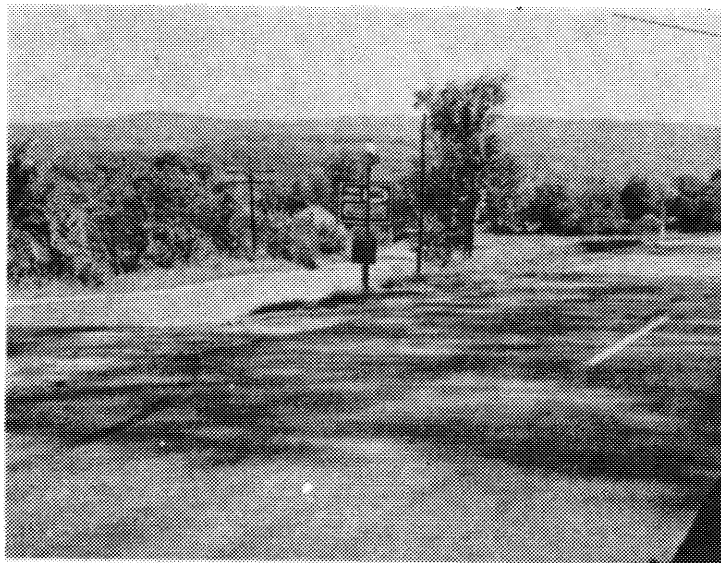
The total annual recreation benefits which include the initial attendance of 250,000 visitor days at \$1.00 per visitor-day or \$250,000 annually plus the growth benefits of \$160,000 are equal to \$410,000.

6-04. Benefit-to-Cost Ratio

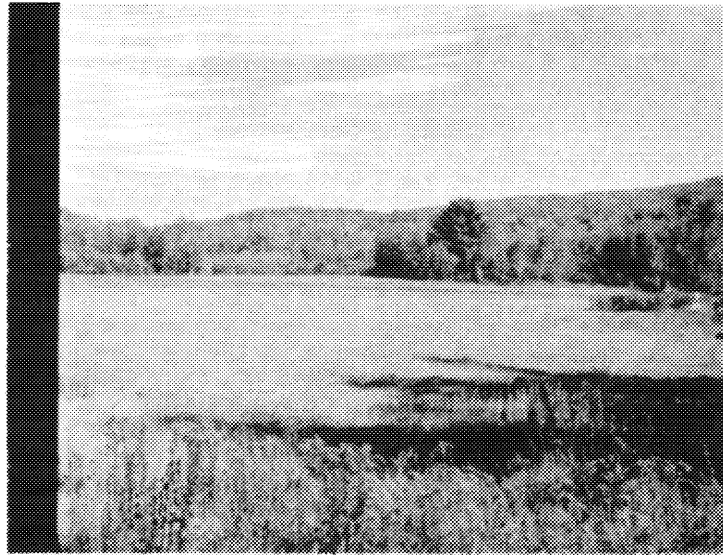
With the average annual recreation benefit of \$410,000 and the annual incremental costs of \$117,000, the benefits are in excess of the costs and the benefit-to-cost ratio is 3.5 to 1.0 for the recreational features.



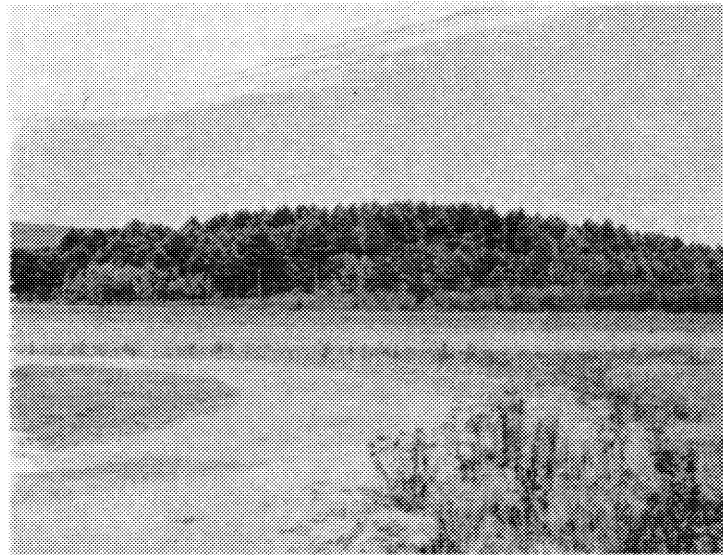
From Unity Road looking northwest-Green Mountain Peak in the distance. At left would be the proposed dam location. Cleared area in foreground would be flooded by proposed conservation pool.



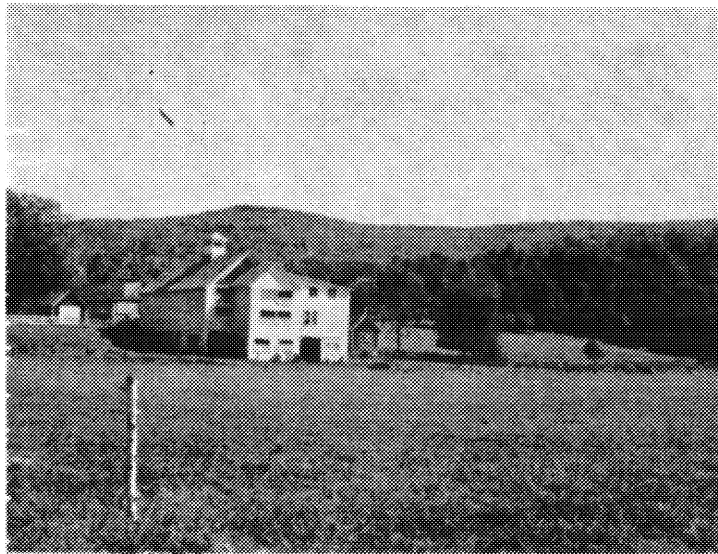
From Intersection of Unity and Puckershire Road looking east with Mount Tug and Unity Mountain Range in background and Pike Hill in center.



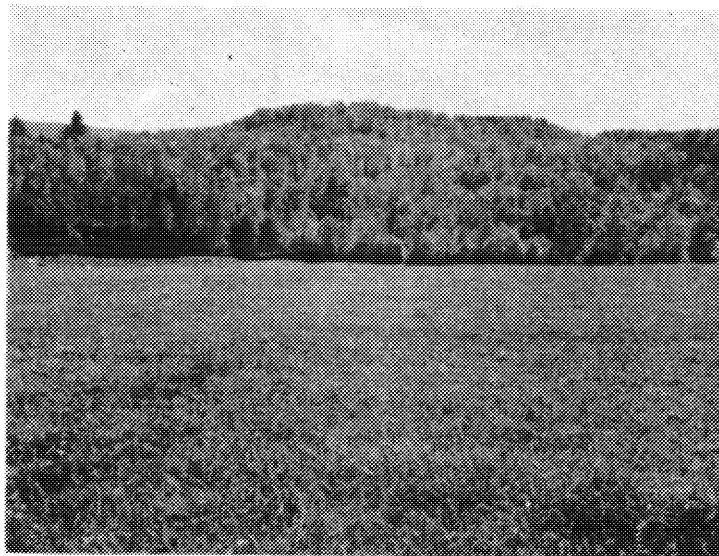
Looking east at shoreline of proposed beach development. Pike Hill at right and hill at elev. 920 msl in center. Open field in foreground to be covered by proposed pool.



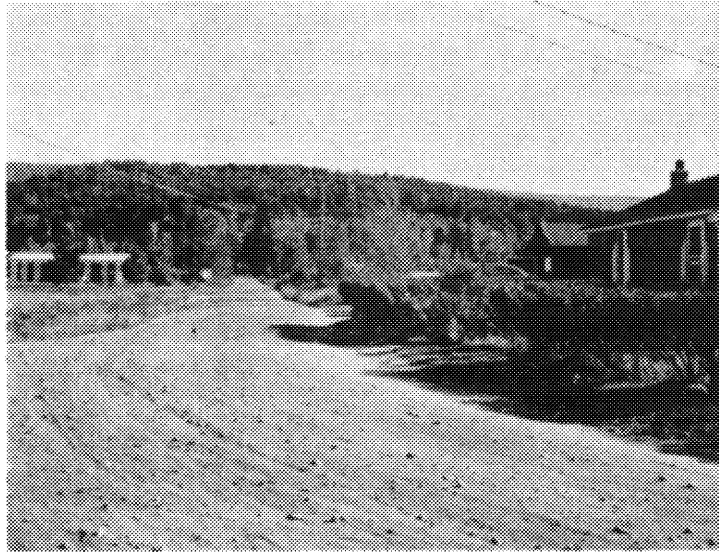
Looking northeast at shoreline of proposed beach development. Pine Knoll in center is site of proposed picnic area. Area in foreground to be covered by proposed pool.



Open area behind proposed beach (parking area for beach) looking east with 920-foot hill (proposed group camping site) behind farm house.



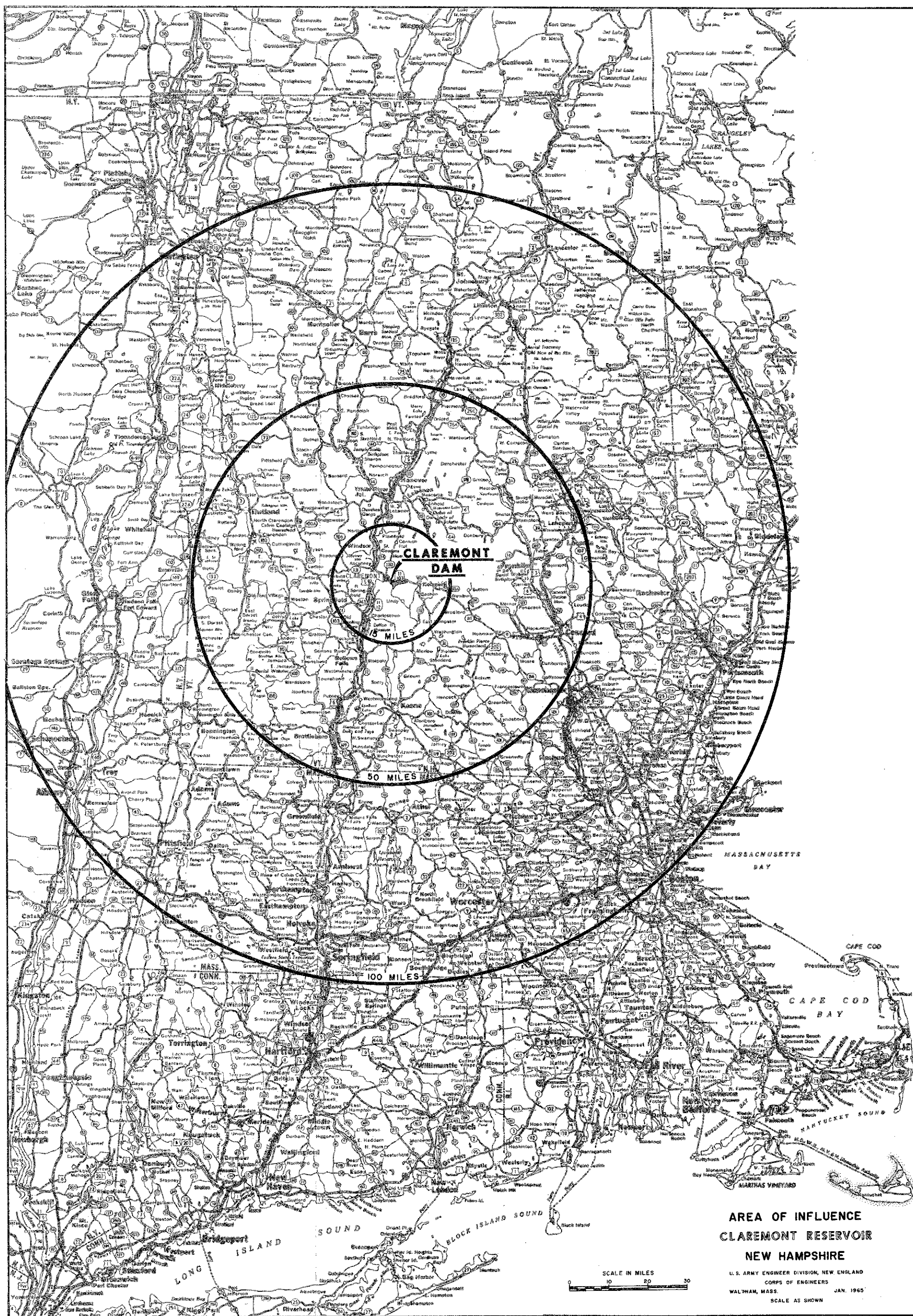
Same area as above looking southeast towards Pike Hill.

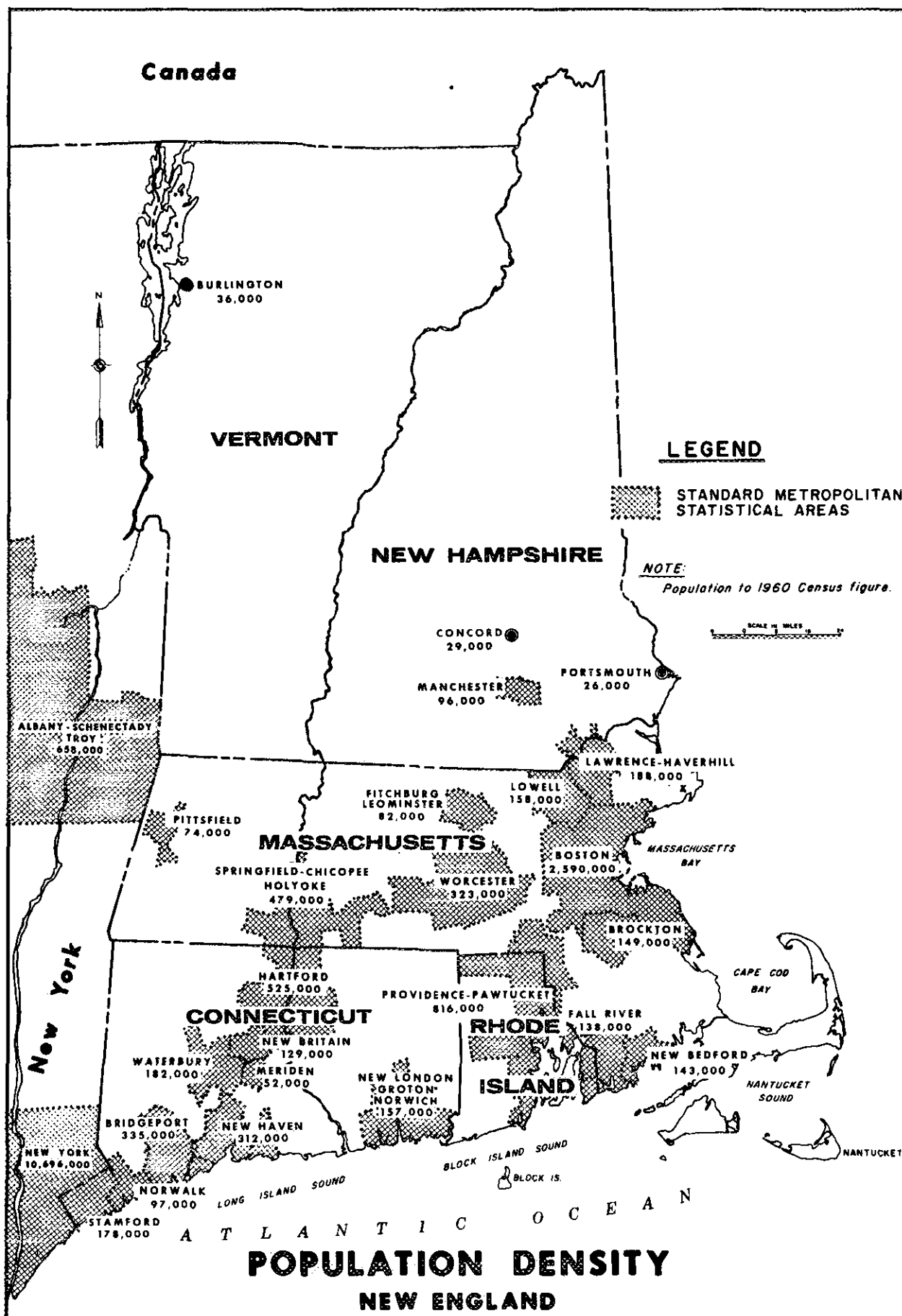


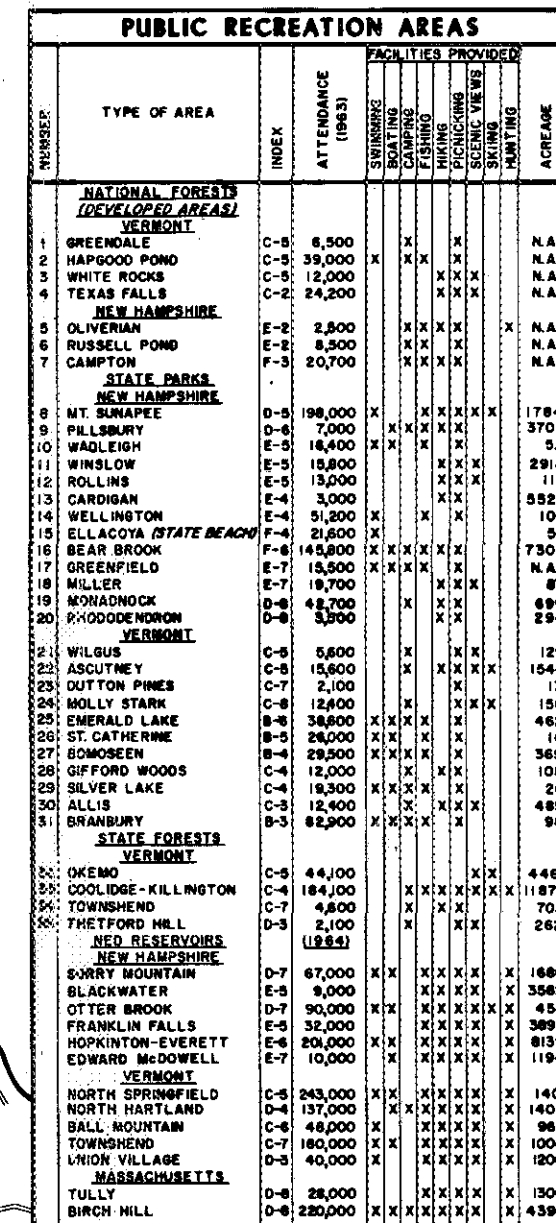
From foot of Pike Hill Road looking south toward Pike Hill. House and trailer in foreground to be covered by proposed pool.



Looking east from river road towards Newport. Covered railroad bridge at Chandlers Mills.







CONNECTICUT RIVER FLOOD CONTROL
PUBLIC RECREATION AREAS
WITHIN 50 MILES OF CLAREMONT RESERVOIR

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS. JAN 1965

SCALE AS SHOWN

PL

